Music, Soundscape and Acoustic Sustainability

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1. Music and Environment

With environmental issues and the concept of sustainability being of current concern, some artists and musicians are considering their relationship to such issues, and asking what responsibility they might have as a result and what practical contributions they are qualified to make. Music in Western culture, I would argue, has become separated from its broader environmental context over the last two centuries, both in the classical tradition of privileging standardized performance spaces, and by the processes of commodification in the commercial context. When music is conceived as an abstract art form, it is not surprising that this separation from context, or more precisely, its inclusion in standardized contexts, becomes the norm. References to real-world imagery can be made in such music, but they remain at the level of metaphor in instrumental music and textual references in vocal music. The expansion of musical resources in the 20th century appeared to bring "non-musical" sounds and noises into the realm of composition, often in direct reference to the growing industrialization of society (Thompson 2002, chap. 4), but the direction of influence was largely from the environment into the music, and not the other way round. It remained for John Cage most notably to suggest a reversal of that process in the sense of listening to the environment as if it were music, most famously in his 4'33" work. However, it is not clear if such an expanded awareness should lead to musicians taking any responsibility or action that would relate to environmental and social issues.

In this paper I will argue that there are two main directions that are relevant to musicians, the first being the ways in which musical qualities can be integrated with external referents in a meaningful and creative manner, and the second being the ways in which the skills of musicians and composers can be profitably applied to environmental

concerns. I will deal with the second of those issues first in the next section. Both approaches may involve traditional acoustic resources, but both may also profit from contemporary electroacoustic practices. However, a significant conceptual change is central to both approaches, namely placing an emphasis on sound as distinct from the more restricted concept of music. It is not merely an issue of accepting all sounds as potentially musical, important as that is, but rather considering all facets of aurality as being potentially within the domain of a musician's concern. Many challenges arise if we embrace this expanded domain, not the least of which is the interdisciplinary knowledge base that exists, usually couched within specialized terminology and scientific discourse in different disciplines. Musical training often does not extend beyond a simplified knowledge of acoustics, though electroacoustic music training sometimes includes a wider range of concepts and terminology that arise from sound design and signal processing.

I have personally found it most useful to ground an approach to these issues within three interrelated concepts: soundscape, acoustic communication, and acoustic ecology. The soundscape concept refers to an environment of sound (whether acoustic or electroacoustic) with an emphasis on how it is perceived by listeners, as defined in the *Handbook for Acoustic Ecology* (Truax 1999). Acoustic communication is the term I have applied to the study of how information flows between listeners and their environments, and how sound creates relationships, both personal and social (Truax 2001). This study embraces all aspects of speech, music and environmental sound as elements in a communicational system, including their technologically mediated forms. And finally, acoustic ecology refers to the system of relationships between organisms and their sonic environments with particular emphasis on a functional balance or an attention to dysfunctional behavior. This characterization of acoustic ecology is my own interpretation of the concerns shared by the World Forum for Acoustic Ecology (WFAE) that as an emerging interdiscipline cannot be expected to have fully agreed yet on a particular definition, though the website (wfae.net) suggests that "WFAE members represent a multi-disciplinary spectrum of individuals engaged in the study of the social, cultural and ecological aspects of the sonic environment." However, these concepts taken

together create a strong framework, in my opinion, for addressing the complexity of issues involved in what might be called acoustic sustainability, that is, our ability as a culture to live within a positively functioning soundscape that has long-term viability.

2. Musicians and Ethical Responsibility

I personally believe that individuals should make decisions about ethical responsibility according to their own conscience; however, such decisions are best made when facts are available. The issues that most directly involve musicians are arguably those involving hearing and listening which occupy a central position in our practice. The risk of hearing loss should be a serious concern, particularly to a profession that depends on it, and yet I have found that students receive very little education about hearing risks in schools, and possibly least of all from music teachers. Even worse is the common occurrence that band rehearsal rooms are often poorly designed acoustically, and sound levels can easily exceed 85 dBA, a level that audiologists regard as a threshold for the risk to hearing, depending on the length of exposure. It is tragically ironic that some high school music teachers have had to retire early because of occupational hearing loss. Moreover, students who form their own bands frequently rehearse for hours in even more confined acoustic conditions, sometimes without adequate hearing protection. Audiologists have some jurisdiction over workplace conditions through local health and safety regulations, but no such legislation applies to leisure or voluntary activities. If such students also work in noisy environments, the dangers are compounded. Any attempt to warn students about these risks is often regarded as an attack on "their" music, hence the strategy of some hearing risk campaigns to include warnings from rock musicians who have lost a substantial amount of their hearing. Any high level sound, not just music, can create a hearing risk, and various types of occupational and non-occupational exposure can combine to elevate that risk. Early warning signs such as a ringing in the ears and difficulty understanding speech in noisy environments can help to point out the danger. Professional musicians can also be at risk, as a study of musicians in the Vancouver Symphony Orchestra (Eaton and Gillis 2002) recently showed. About one-quarter of the musicians showed a significant high-frequency notch in their audiograms, consistent with noise exposure, the greatest risk being observed for the brass section.

Beyond the risks to hearing, noise exposure can result in various forms of stress on the body, including interference with sleep rhythms, as well as task performance, effects that should be of concern even to young people who are often subject to other forms of stress. Scientific evidence about these risks and effects is abundantly available (Suter 1992), but effective communication to the public at large, and students in particular, is generally lacking. It is somewhat paradoxical that the stimulus value of musical sound at certain levels and in certain contexts can turn into a stressor that we call noise at higher levels and in other contexts. The dividing line along that continuum is difficult to determine, and can be highly variable for different individuals at different times, in different moods, and involved with different activities. Perhaps the most useful approach is to draw attention to the relative nature of that distinction, as well as to the proven risks at different levels of exposure.

Musicians are uniquely qualified with respect to listening skills, and yet are those skills actually fostered in music education? Ear training exercises usually involve identification of elements of pitch and harmony, as well as rhythmic patterns; music "appreciation" may involve listening for elements of musical style and structure. As valuable as these skills are, they remain specialized and in the service of music theory and musicology, with little transference to daily life. In the tradition of R. Murray Schafer's "earcleaning" exercises that originated in his educational booklets from the 1960s that are now collected into a single book (Schafer 1986), but which are often still missing from music curricula, I would suggest that the simple strategy of the soundwalk should be introduced at all educational levels. This kind of listening walk can be done anywhere by any group (or individual), where one silently follows a planned or improvised path through various acoustic environments, and always proves beneficial to participants in sharpening their listening skills. It is aided by the walking activity and the leader's direction to focus on sound, and not on the usual internal dialogue that fills our minds. Sound journals, and self-documentation of acoustic experiences with portable recorders, iPhones, etc. can also be beneficial in focusing one's attention on everyday sonic experience. It has been our experience at Simon Fraser University (SFU) that such practices can readily initiate a

process of increased environmental awareness that benefits not only one's sensitivity and openness to music, but also to the soundscape in general. It also answers Schafer's rhetorical question about how we can expect listeners to be sensitive to the subtle and often intricate designs of contemporary music if they are otherwise used to shutting out unwanted sounds and being relatively insensitive as listeners on a daily basis.

The practice of soundwalking usually leads to questions about the acoustic design of our environments, both in the local sense and sometimes to our built environment as a whole. For a musician, these questions might lead to an extrapolation of the criteria for music composition to that of the environment, a prescriptive approach or what Schafer (1977) originally titled his book, *The Tuning of the World*. In other words, composers may feel a social and ethical responsibility for the acoustic environment, but are they well positioned to judge or impose its design? In a recent text (Truax 2012) I have referred to this as the "aesthetic dilemma" since it may involve the aestheticization of the soundscape, and the belief that the musician can function as an expert in acoustic design. While the musician's ear is clearly valuable for critical listening, and the composer's sense of balance and proportion is likewise useful for design, I do not believe that a purely aesthetic approach is sufficient, and might better be restricted to "sound art", as discussed in the next section. I prefer to rely on a communicational model that analyzes how sound functions for the individual and society in particular contexts. In other words, the inner properties of sound, as well as their patterns of organization, may display the positive attributes we find attractive in music, but it is the information and meaning which the sound acquires socially and culturally that completes its communicational potential (Truax 1992, 1994). For example, the most exquisite sound sculpture will not function well in a noise-ridden environment where people do not listen attentively. In that case, the listening context must be designed as well. A more radical approach might be, not to add more sounds to an environment, but to create "space" for the sounds that are potentially present to emerge and be heard.

Still, I see no reason why musicians should not be involved in social and environmental issues involving sound, or even those that don't. They may simply have more motivation,

as did Schafer whose original efforts were at least partly in reaction to the increasingly noisy urban environments of the 1960s. However, for their efforts to be effective, I think they need to say something more than simply "I don't like it". Negative acoustic phenomena may well be aesthetically unpleasant, but that does not provide an adequate basis for negotiating change. For instance, Schafer had an intense dislike in the 1970s for background music (which he derisively termed "Moozak"), but what reply could he have had if someone stood up (like Cornelius Cardew did once as I recall) and said "But I like it"? Acoustic design will hit a predictable impasse if it is based on personal likes and dislikes. A more fruitful approach would be to examine the impact of any acoustic phenomenon on listening practices and habits, as well as to its contribution, positive or negative, to what I call the "acoustic community" (Truax 2001), a social structure where sound plays a pervasive role.

In the background music example, for instance, one could examine the functional role of music that is imposed on different environments, independent of stylistic preferences, as well as its political economy. Hildegard Westerkamp (1990) did exactly this, based on her MA thesis, calling the phenomenon "music-as-environment". By the 1990s, intentionally designed foreground music had largely replaced background music, and more recently, portable musical accompaniment via the iPod has become the norm. In other words, the passivity implied by background music has been supplanted by a user-determined accompaniment that thrives on the listener's involvement that is designed to fulfill certain functional roles (Bull 2000, 2006, 2007). Whether listeners can also re-negotiate the potential social disruption such forms of acoustic isolation produce remains to be seen, but certain mitigating practices appear to be emerging. However, in the larger picture, none of this shifting social phenomenon has anything to do with the musical content involved and much more to do with the individual's relationship to self and society as mediated by the music. Aesthetic bias has to be replaced by communicational function for one to understand the shift.

In summary, musicians and composers may well feel motivated to apply their skills beyond their practice of music to broader social and environmental issues, and their

concern is to be welcomed. However, they will need to expand their frame of reference, and usually their knowledge base, such that their role may evolve to what might be called an aural educator, a sound designer, an informed mediator, a social activist, an acoustic ecologist or a contributor to an interdisciplinary team. Social and cultural knowledge will need to be integrated within their aesthetic sensibilities. They will need to rub shoulders with practitioners of other disciplines, such as those represented in the WFAE. And they may need to listen as never before. However, they may also find it equally stimulating to bring real-world issues into their own practice, the challenges and opportunities of which will be discussed next. The results may create a dramatic reversal of both the aloofness of abstract music and the blatant impositions of background music; we can call this new perspective "environment-as-music".

3. Environment as Music

Can artistic practice be applied to and incorporate environmental concerns without compromising its artistic integrity? In the past, one fear was that art becomes a form of propaganda when placed in the service of some political goal. Such concerns are valid, but I would like to suggest that we may approach the problem differently by asking how external referents can be meaningfully incorporated into musical designs, hopefully without compromising their musicality. The following continuum may be instructive:

Internal Dominant (text) <————————> External Dominant (context)

At the left we have abstract music that is predominantly a text where the typical external referent is often the composer's stated "inspiration" for the work. As important as such inspiration is to the composer, it usually has little influence on how the listener perceives the work, particularly those that have stylistic similarities to other such pieces. Listeners are often curious about composers' sources of inspiration and compositional process, but usually the musical result stands on its own without that information, no matter how intriguing it may be. At the other end of the continuum we can imagine the extreme of external influences (or context) being dominant, which can be the result of sonification, that is, the mapping of external world data onto acoustic and hopefully musically relevant

parameters. In such cases there is no guarantee of artistic value, and the entire exercise may be thought of art in the service of science, presumably to make patterns in the data audible. I would like to explore the area in between these two extremes, and ask how musical qualities can be integrated with external referents. I will subdivide the discussion into the areas of the physical, psychological and social dimensions (among possible others).

3.1 The Physical Level

The physical level includes the performers and audience in a specific acoustic space and temporal context, and interestingly enough, the ways in which these may be integrated within the music are different depending on whether we are considering acoustic music or electroacoustic possibilities. With traditional acoustic composition, it is regarded as sufficient that one write a score for any performer(s) capable of playing it, usually for performance in a standard concert space at a familiar time for any audience that might be in attendance. Of course, history abounds with counter-examples, where composers have been inspired by the skills of specific performers, have adapted their work to a specific acoustic situation (e.g. church), or have been commissioned to write a piece for a specific occasion and/or audience. But despite the origins of most of those pieces, it is usually assumed that the work will translate into a more generic form of performance if it survives any length of time. The reverse can also be true, where we sometimes like to re-create the original instruments and acoustic space of the work's origins. All of these practices are fine, but I am suggesting that the composer could also make a work more site-specific and performer-specific in the sense of allowing the external context to deeply influence the shape of the piece, not simply be adapted to it, as practical as that may be. For instance, what kind of music would work best in an abandoned factory or on the shore of a lake, and how could it interact with that specific acoustic situation? What if the piece took on a theatrical element by being designed for a specifically gendered performer with certain acting skills? What if the piece were designed to be performed only at a specific time or special event? Admittedly, more adventurous composers have attempted all of the above at various times with varying degrees of success, but my point is that the audience will likely become involved in those works in a very different manner

than if the piece were played on a conventional concert surrounded by unrelated pieces, mainly because of the external contextual referents to which listeners bring their own knowledge and familiarity.

Electroacoustic practice extends these possibilities into many new directions. For instance, multi-channel diffusion with speakers placed at different locations and heights around a space can create the illusion of being present in a completely different space than the physical one. With the portability of equipment, that space can theoretically be anywhere and therefore potentially related to the work at hand. Admittedly the reproduced sounds will interact with the actual space, potentially desirably or less so if it is acoustically dampened, but that simply offers the composer/diffuser additional options which might result in specific speaker placements or level controls. References to culturally specific temporal markers can also be imbedded in the work, such as my work *Dominion*, whose sections are based on the sound signals that mark noonday in the various time zones of Canada, or *Pacific*, which includes sounds from both Vancouver's marking of the New Year, and the Chinese community's version of the same event. Performers can be electronically enhanced in a number of striking ways, for instance by making them appear to interact with the virtual world of an electroacoustic soundscape, a kind of dramatic form of expression that might suggest the inner world of imagination, dreams and memories, as discussed in the next section. And finally, electroacoustic works can also be used in situations or media where the audience is indeterminate; in an installation or broadcast, for instance, one does not know when an audience member begins listening, hence the usual logic of musical structure must be reconsidered and different forms need to be developed. As exciting as all of these electroacoustic possibilities may be, it does not guarantee their exploitation, and many electronic works seem to assert their own autonomy by being imposed onto a specific context with little relation to it. However, the possibilities are endless for creating work that is tailored to a specific environmental context in a manner that is relatively free of the usual physical constraints, perhaps incorporating other art forms as well as content related to the real or imaginary world.

3.2 The Psychological Level

I referred above to the potential of electroacoustic sound to evoke the internal world (what I will call the psychological level) of imagination, dreams and memories, aided by the inherently disembodied nature of electroacoustic sounds whose original sources are not physically present. Of course these sounds have been re-embodied in the loudspeakers being used, but audiences are used to understanding that the speakers are merely the means by which the sound is being reproduced; however, this is not to deny that the speaker as a physical object could be highlighted as an inanimate "speaking object" for dramatic effect.

The fluidity of processing sound electroacoustically facilitates its transformation from the real to the imaginary as long as the real-world reference is maintained at some level. An early and still effective example of an extended scenario based on this principle is the 45-minute work *Red Bird* (1977) by Trevor Wishart who created the harsh imagery of a political prisoner's dream through transformation of sonic archetypes (Wishart 1996). It is then a small step for such sounds to begin to function as metaphor and suggest an inherent symbolism. In *Red Bird*, birdsong is a metaphor for freedom and repetitive machine-like sounds are a metaphor for closed systems such as a prison. The long final section of the piece can be heard as a slow ascent towards the goal of freedom as the gurgling subterranean sounds gradually transform into bird cries. Interestingly enough, Wishart creates his "machine" sounds from mainly human vocal sources, thereby avoiding the cliché of actual machines being portrayed as inhuman and oppressive, and instead suggesting an ambiguity in the symbolism.

Although a reliance on literary analogies in music should be carefully considered, I suggest that sounds can also be metonymic, that is, a sound can represent a larger entity with which it is associated. For instance, in my piece *Basilica*, its soundscape and evocation of a resonant cathedral are entirely derived from the processed sound of three church bells. By stretching the bells in time, and mixing them with upward and downward pitch transpositions, I was able to expand their own resonances to suggest the large acoustic space of a basilica (Truax 1994a) and a soundwalk through it. In fact the

soundwalk can function as a reference for the temporal structure of any soundscape composition where the listener appears to travel through various acoustic environments (Truax 2002). However, that sense of travel may be inward to the psychological level as much as it is external, or else elements of both may be included. My piece *Pendlerdrøm* follows a commuter's trip home at the end of a day, starting in a busy train station, then boarding a local train, with two interludes that suggest the commuter's daydreams en route (Truax 1998). Sound events from the more realistic sections of the work appear in these interludes as blurred transformations that move around the listener with the fluidity of dreams, as opposed to the distinct spatializations of the real-world soundscape.

Finally, electroacoustic soundscapes can embody narratives, similar to the soundwalk or even more specific as a story when voice and text are involved. Such narratives can be situated in the present, the past or in the form of a myth. Anna Rubin's piece *Family Stories: Sophie, Sally* tells the story of a young Jewish girl and her Afro-American nurse growing up in the racist culture of the Southern U.S. where the electroacoustic soundscape re-creates the events and emotions of the past. Scripts, found texts and historical recordings can be used in a variety of ways to re-embody cultural events and issues (Lane 2006), including issues of gender and sexuality (Truax 2003). Multi-channel soundscape compositions can also suggest mythical places and events, such as my piece *Island*, which takes the listener to an imaginary island whose "magical" qualities are suggested by the transformed versions of the hyper-realistic soundscape materials. A more recent work, *Chalice Well*, takes the listener down into the mythical caverns with their gateway to the underworld beneath Glastonbury Tor in England, thought to be the legendary Isle of Avalon. The technique of convolution was used extensively in this piece to create acoustic "hybrids", that is, sounds with the character of more than one source, but lacking the hard edges of real-world sounds. The male and female vocal sources when processed in this way suggested another layer of symbolism associated with the feminine gendering of the well and the masculine gendering of the underworld. At the entrance to the underworld, a sound that symbolizes the Holy Grail appears and quells the danger.

I have cited these examples in order to suggest the range and depth of possibilities that electroacoustic transformation allows the composer to utilize in terms of expressing conceptual and psychological experiences. It is surprising to me that greater use is not made of this potential, particularly in combination with theatre, opera, dance and film where the impressive skills in sound design possessed by electroacoustic composers seem seldom exploited to the full. A striking exception to this lack is John Young's narrative work *Ricordiamo Forli*, which tells the story of a moment in the liberation of Italy involving the conflict at the town of Forli where Young's New Zealand father met his Italian mother. This prize-winning work, created in the tradition of radio drama, incorporates many of the dynamic sounds one associates with acousmatic music and that far surpass the sound effects one might expect in a more conventional program. In general, sound artists more commonly use real-world sounds but with typically less processing, and the majority of electroacoustic composers seem more inclined towards abstract sonic works.

3.3 The Social Level

By the social level, I am referring to works that draw on the audience's knowledge of social, political, cultural (including media), economic, and environmental contexts evoked through both text and soundscape. I will refer to all such works as soundscape compositions, but to avoid confusion it might be better to refer to them as context-based works where the use of environmental sounds is merely one option. Of course the contextual knowledge needs to begin with the composer, and in fact, may require research to extend that knowledge. The purpose may also be to enhance the audience's awareness of the particular social or environmental issues involved, and here we return to the central concern of this paper, how issues around environmental quality and sustainability can be addressed musically.

Installation artists often lead the way in this domain. Gordon Monahan, for instance, adopts one approach where he integrates his installation into a specific site, usually with the site interacting with his sounding elements. In a sense, he is mapping the site onto his acoustic installation, rather than adapting his installation to fit the site. Any sound

sculpture activated by the environment can therefore be regarded as a form of soundscape composition. Andrea Polli's installations often map real-world, environmental data onto her soundscapes in an extension of the sonification practices referred to earlier. In some cases, her work as an artist is to mediate between scientific data collected by experts and the public's understanding of that data. The artistic skill involved is dedicated towards communication about the environmental issue involved, rather than to produce a self-contained work of art.

There is clearly no limit to the type of social or environmental issue that could be addressed by a composer, and a key point is that it becomes obvious to the listener what the piece is "about", without having to consult other sources such as a program note. I often observe that when composers talk about their work, what they think it is about has little or no relation to what the audience has understood or could be expected to understand. Possibly composers confuse their own sources of inspiration with what has gone into the material of the piece itself and how it will be received. I attribute the mis-communication to at least two sources: the lack of the composer letting the work be influenced and structured by the external context in a deep enough manner, relying instead on familiar techniques and styles of expression, or what John Drever (2002) refers to as "sonic tourism"; and secondly, misjudging the communicational strategy that a sound-based piece requires to be understood, particularly if unaided by textual material in the work. These problems are not easy to solve, and as yet, we have a limited number of exemplary works to refer to. Unfortunately we also as a community of artists may encounter a residual bias against any such move away from abstraction as the preferred norm (e.g. with pejorative labels such as program music or functional music). I frequently note that when young composers begin expressing an interest in soundscape composition, they suddenly realize that most of their musical training suddenly seems irrelevant in that it did not prepare them to deal with contextual issues. A shift in educational strategy is clearly needed.

4. Conclusion

I have argued that the musician's skills can be applied in addressing environmental and social issues, and that those issues can possibly be integrated within creative artistic practice. However, for these processes to be successful, an expanded conceptual framework and knowledge base is needed, often going beyond what conventional music education currently provides. This extension involves broadening the scope of music to all sounds with the knowledge of how they function in all forms of acoustic communication. It may simply involve expressing concern for the aural health and listening skills of our students, children and fellow citizens, or it may involve more ambitious projects for soundscape preservation and enhancement. Equally challenging is the expansion of compositional practice to embrace context-based work, in whatever form that may take. Currently, it does not seem that acoustic concerns are on the broader environmental agenda and discussions about sustainability. However, I believe that the artistic community does have something valuable to contribute to these issues, as initiatives such as the Ear to the Earth artist group indicate (www.eartotheearth.org). Are not examples of well-functioning acoustic communities, when considered ecologically, good models to be emulated for other eco-systems? In fact, landscape ecologists have recently begun to suggest that "soundscape ecology" is an important aspect of their field of research (Truax and Barrett 2011). Likewise, do not well-designed soundscape compositions create positive listening experiences that may influence how listeners interact with the world outside the artistic context? In fact, if listeners do not experience such alternatives to their everyday negative soundscape experiences, will they realize that the world could be different? Such work need not be at the expense of artistic activity for its own sake, and the cultural benefits that ensue; in fact, it may present a powerful means by which artistic work re-invigorates its social role.

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